Supporting provision of sensor metadata through multi-tenanted management of SensorML documents

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Aims

- MD Editor (EDI) for compilation of valid and profiled SensorML (v1.0.1 and v2.0.0)
  - computer-assisted editing
  - semantic enrichment

- Facilities for the creation of sensor MD starting from existing sensor model descriptions (blueprints)
  - invariant SML parts already filled in by sensor manufacturers (more authoritative & homogeneous)
  - speeding up MD completion by sensor owners (that provide only owner-specific parts)
Metadata management in project RITMARE

1. System administrator
   - XML editor
   - XML Schema

2. Sensor manufacturer
   - EDI template
   - POST data
   - SensorML prototype

3. EDI server
   - SensorML blueprint
   - Blueprint collection

4. EDI client

5. SensorML metadata

- User interaction
- Input/output
EDI a customizable, semantics-aware metadata editing service

client-side component

- INSPIRE
- RNDT
- Several profiles of SensorML (v1.0.1 and v2.0.0)
Instructing EDI to assist authoring profiled SML

how to

OGC® Best Practice for Sensor Web Enablement
Lightweight SOS Profile for Stationary In-Situ Sensors

7.2 Profile-specific Schema of a Sensor System

Every sensor system shall be modeled as a PhysicalSystem. The following metadata items are mandatory for a PhysicalSystem which conforms to this profile:

- gml: description (mandatory):
  - Short textual description of the sensor or sensor system.

EDI SensorML20_lightweight v1.00

Description of system

Physical system name

Description of the physical system

Keywords

Identification of the system

Temporal validity of metadata description

Characteristics

Capabilities

Relevant Contacts

System Documentation

Manufacturer name

OutIndex

hasDatatype: text, hasDatatype:

hasPath: gml: description

isFixed: false, isFixed:

hasDatatype: text, hasDatatype:

help xml:lang="en">Brief description of the sensor system. It should be short, while it is not its description. It could coincide with the name given by the manufacturer</help>

Prezi
Instructing EDI to assist authoring profiled SML

- The outputs of the sensors attached to the sensor system.
- Each child-element of an "output" has to use the "definition" attribute to specify the URI of the observed property. If the child-element of the output is a "swe:Quantity" it has to contain the "swe: uom" element which specifies the "code" attribute stating the UCUM code.

Example SML code:

```xml
<datasource>
  <id>parameters</id>
  <singleton>true</singleton>
  <endpointType>virtuos</endpointType>
  <query>
    <![CDATA[
      {PREFIX skos: http://www.w3.org/2004/02/skos/core#
      SELECT ?c ?t
      FROM http://ittimaire.it/rdfdata/parameters
      WHERE { ?c rdf:type skos:Concept.
      OPTIONAL { ?c skos:notation ?n. }
      OPTIONAL { ?c skos:prefLabel ?l1. }
      FILTER(LANG(?l1) = 'en')
      OPTIONAL { ?c skos:prefLabel ?l2. }
      FILTER(LANG(?l2) = 'en')
      FILTER(REGEX STR(?l), 'Search Paramount')
      REWRITE STR(?l) AS ?param
      ORDER BY ASC(?t) ASC(?c) }
    ]}]]
  </query>
</datasource>
```
Assisted editing example: exploiting sensor manufacturer FOAF graph

```
<datasource>
  <id>manufacturers</id>
  <singleton>true</singleton>
  <endpointType>virtuoso</endpointType>
  <query>
    <![CDATA[
      PREFIX ns: <http://www.w3.org/2006/vcard/ns#>
      SELECT ?c ?l
      FROM <http://ritmare.it/rdfdata/manufacturers>
      WHERE {
        ?c rdf:type foaf:Organization.
        ?c foaf:name ?l.
        FILTER( REGEX( STR(?l), "$search_param", "i") )
      }
      ORDER BY ASC(?l)
    ]]>
  </query>
  <type>sparql</type>
</datasource>
```
Assisted editing example: exploiting sensor manufacturer FOAF graph

```xml
<dataSource>
  <id>info_manufacturers</id>
  <singleton>true</singleton>
  <endpointType>virtuoso</endpointType>
  <query>
    <![CDATA[
      PREFIX addr: http://wymiwyg.org/ontologies/foaf/postaddress#
      PREFIX vcard: http://www.w3.org/2006/vcard/ns#
      FROM <http://ritmare.it/rdfdata/manufacturers>
      WHERE {
        OPTIONAL {
          <$search_param> foaf:phone ?phone .
        }
        OPTIONAL {
          <$search_param> vcard:email ?email .
        }
        OPTIONAL {
          <$search_param> foaf:homepage ?homepage .
        }
        OPTIONAL {
          <$search_param> addr:address ?b1 .
        }
      }]
    ]]
  </query>
  <triggerItem>manuf_name_3_uri</triggerItem>
  <type>sparql</type>
</dataSource>
```
Metadata management in project RITMARE

1. System administrator uses an XML editor to create an XML schema.
2. Sensor manufacturer creates an EDI template and sends it to the EDI client.
3. EDI client generates POST data and sends it to the EDI server.
4. Sensor owner sends EDI data to the sensor manufacturer.
5. EDI server receives SensorML metadata.

User interaction: solid lines
Input/output: dashed lines
Instructing EDI to represent invariant information

SML document prototypes (v1.0.1): Blueprinted sensor model

Description of system

Physical system name
- Davis Metro Station - PTF

Description of the physical system
- Professional Vantage Pro2 weather station measures barometric pressure, temperature, humidity, rainfall, wind speed, and direction.

Keywords

- Vantage Pro2
- Weather station
- Barometric pressure
- Temperature
- Humidity
- Rainfall
- Wind speed
- Direction

Identification of the system
MD quality check

Burano (Burano - Stazione Automatica S360A)

Manufacturer Name: EME
Model Number: 360

Parameters
- Installed: 2010
- Location: Venice, Italy
- Operating Mode: Continuous

Position
- Latitude: 45.4217
- Longitude: 12.3456
- Height: 200 m

Contact
- Owner: Venice Authority
- Operator: Venice Authority

Documentation
- Available:
- History
- Maintenance

DescribeSensor2HTML
Thank you for the attention

Any question?

find us on GitHub!
https://github.com/SP7-Ritma
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